REMARKS

The timely filed Reply is in response to the Office Action dated July 29, 2004. In the Office Action, claims 1-17 were pending and claims 1-5 and 9-17 were rejected. Claims 6-8 were objected to but were determined to be allowable if written in independent form to include all limitations of their base claim and any intervening claims. In this Reply, claims 1, 5-9, 11-17 have been amended, claims 4 and 10 have been cancelled, and new claim 18 has been added. Figures 1 and 3 have also been amended to add a power supply 290 connected to the contact brushes 250 and are labeled as "Replacement sheets". Paragraphs 31, 38 and 39 of the specification have been amended to reflect power supply 290. No new matter has been added.

Claims 9-12 and 14 were rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. The claims were determined by the Examiner to contain subject matter which was not described in the specification in such a way as to enable one skilled in the art at the time of the invention to practice the claimed invention.

According to the Examiner:

> [t]he connection of the electrical power source to the heater as recited in claims 9-11 is not understood. The construction of the spring-loaded electrical contact brush is especially not clear. Also, the control unit of claim 12 is not understood. The types of controls recited, i.e. the time clock, differential pressure controller and optical sensor, have not been explained adequately. Finally, it is not understood what is meant by the condensate drainage piping being "heat traced," as recited in claim 14.

Applicants respectfully disagree with the rejection of claims 9-12 and 14 under 35 U.S.C. §112, first paragraph for enablement. Claim 9 as amended is dependent on claim 7 and recites at least one electrical power source. As clear to one having ordinary skill in

the art at the time of the invention by reference to original Figs. 1 and 3 and the specification (particularly paragraphs 31 and 38) the metallic elements (220 in original Fig. 1 and 420 in Fig. 3) (on or within the filter material recited in claim 1) are heated by the claimed power source to melt ice which is disposed on the filter into water when the contact brush (recited in claim 7) is aligned so that it is in contact (creating electrical contact) with the metallic element, thus completing a closed electrical circuit.

Claim 7 is dependent on claim 6 which recites the system includes a motor for rotating the trapping device. Through suitable rotation, the desired alignment of the contact brushes with the metallic elements is periodically achieved. The contact brush together with the metallic element on or within the filter material when placed in physical contact by rotation driven by the motor completes the electrical circuit. The current provided by the power supply can then flow in the resulting closed loop electrical circuit. The resulting Ohmic heating functions as the heating mechanism and raises the temperature of the ice and thus melts at least a portion thereof.

Original claim 10 which had erroneously recited the electrical power source is an electrical contact brush has been cancelled. The contact brush as noted above functions to complete the electrical circuit when the metallic elements on or in the filter material is brought in physical contact with the contact brush, such as by a motor.

Claim 11 recites the electrical contact brush is spring-loaded. Spring loading is well known to provide electrical contact for circuits where movement occurs to complete the circuit, and as a result friction occurs. Spring loading assures reliability because when the electrically conductive material (typically a metal) on the brush and/or filter is lost due to friction, the spring loading ensuring electrical contact whereas a system

without a spring would fail (due to an open circuit at the contacts) if a small amount of wear takes place during operation. For example, spring loaded brushes are used in many motors, such as several electric drills on the market that have been publicly available for decades which use spring loaded brushes as contactors for the rotor in the electric motor. Accordingly, since the connection of the electrical power source to the contact brushes to heat the metallic elements recited in claims 9 and 11 is clearly described by Applicants' specification to one having ordinary skill in the art and is easily implemented with Applicants' invention without undue experimentation, the 35 U.S.C. §112, first paragraph rejection of claims 9 and 11 should be removed.

Claim 12 recites at least one control unit coupled to the motor for controlling when to initiate rotation of the filter device, the control unit being a time clock, a differential pressure controller or an optical sensor. This feature is described in paragraph 35 (which references Fig. 2) of Applicants' specification and is copied below in its entirety for convenient reference:

> The device 300 of the invention can be further configured to include at least one control unit 390 for control of various operations of the device 300. Suitable control devices are well known to those having ordinary skill in the refrigeration, defrosting and air conditioning arts, and can include, among others, a time clock, a differential pressure controller, and/or an optical sensor. Such devices can be used, for example, to automatically activate a motor for driving movement of the filter 310. As is well known, activation can be initiated by these devices on the basis of various parameters, for example, duration of compressor operation, changed pressure conditions within the refrigeration unit, or optical detection of an exceeded level of frost accumulation.

As noted in paragraph 35 copied above, the recited control units 390 are well known to the artisan having ordinary skill at the time of the invention, and for decades before. For example, a time clock is and has been the basis of the defrost timer on conventional frost-free refrigerators produced in the many millions per year for several

decades. U.S. Patent No. 6,694,765 to Waldschmidt et al., for example, is cited by the Examiner "for the purpose of controlling the defrosting of the evaporator according to time" by such a mechanism. Rather than using time to initiate the defrost, control units are known to be based on differential pressure (across the filter in the present invention; pressure builds up as ice accumulates) or an optical sensor (light becomes more attenuated upon buildup of ice).

Differential pressure sensors and optical sensors are well known as evidenced by their extensive use in air conditioning filtration systems. Janke et al. in U.S. Pat. No. 4,530,218 disclose a refrigeration apparatus defrost control. This frost sensors disclosed include optical sensors, pressure sensors or an acoustical sensors. (copy attached). Janke in U.S. Pat. No. 4,663,941 discloses a refrigerator temperature and defrost control featuring an optical sensor. (copy attached)

Many large filter boxes on air conditioning equipment are equipped with manometers for monitoring the pressure across filters. These manometers can have a digital interface with a building automation system and will alarm the system when the filter is loaded with dirt and the pressure across the filter exceeds a predetermined level. This is described in American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) handbooks and publications. ASHRAE is a well known international membership organization founded to advance the arts and sciences of heating, ventilation, air conditioning, refrigeration and related issues that publishes handbooks and publications which are frequently relied on. The pressure method and optical methods are also used to control the advancement of rotating filters used in conventional air conditioning systems.

Accordingly, since the claimed control units comprising the time clock, differential pressure controller and optical sensor are easily implemented without undue experimentation based on Applicants' Application, published U.S. patents regarding refrigeration, and/or standard knowledge for one having ordinary skill in the art at the time of the invention, the 35 U.S.C. §112, first paragraph rejection claim 12 should be removed.

Claim 14 which is dependent on claim 13 recites the condensate drainage piping is heat-traced for preventing re-freezing of the water. Heat tracing is shown in Fig. 3 and described in paragraph 40. Heat tracing is well known to the artisan having ordinary skill. For example, heat tracing is described in several locations in ASHRAE handbooks and publications as well as U.S. Pat. No. 5,592,826 to Sagar et al. which discloses the use of heat tape in a refrigeration system (col. 5, lines 56-64).

Heat taping is generally accomplished by wrapping a heating tape around a pipe. The heating tape generally contains an electric heating element (e.g. a nichrome wire) which when electrified, heats up. Heat trace or heat tape is also referred to as "freeze protection cable". A built in thermostatic control is generally provided which will turn the power off and on in the heat strip to maintain an appropriate temperature. In the case of the claimed invention, this heat helps keep the condensate that is collected and drained from the system in liquid form while still exposed to the freezing temperatures of the walk-in temperatures. Accordingly, since the claimed heat-tracing is with standard knowledge for one having ordinary skill in the art and is easily implemented with Applicants' invention without undue experimentation, the 35 U.S.C. §112, first paragraph rejection of claim 14 should be removed.

Turning now to rejections based on art, claims 1, 2, 4, 9, 13, and 15-17 were rejected under 35 U.S.C. §102(b), as being anticipated by U.S. Patent No. 5,675,984 to Shin ("Shin"). Claims 3 and 5 were rejected under 35 U.S.C. 103(a) as being unpatentable over Shin '984. Claim 12 was rejected under 35 U.S.C. 103(a) as being unpatentable over Shin '984 in view of U.S. Patent No. 6,694,765 to Waldschmidt et al. ("Waldschmidt '765").

Regarding claim 1, according to the Examiner:

Shin discloses an evaporator and a trapping device 132, 134 for intercepting liquid in the air flow to prevent liquid from freezing on the evaporator. See for example, column 5, lines 35-40.

Before reviewing the cited art, Applicants will first review the claimed invention as now recited in amended claim 1. Amended claim 1 recites a device for trapping airborne water or ice particles in a refrigeration unit, comprising an evaporator including a plurality of coils, and a trapping device disposed between the evaporator and airflow directed toward the evaporator, the trapping device intercepting liquid water or ice particles that would otherwise accumulate on the plurality of coils. The trapping device comprises a bulk filter material which provides airflow therethrough to the evaporator, wherein at least one metallic element is disposed on a surface or within the filter material.

Applicants' use of a bulk filter material which provides flowthrough of the humidified air removes the need to form pores in a non-porous material to permit the desired trapping function. More importantly, the claimed arrangement is highly efficient due to a large filtering area and several filtration mechanisms functioning simultaneously. Use of essentially the entire filter area significantly raises the trapping capacity of Applicant's filter as compared to non-porous plates having holes formed therein. Regarding the functional filter area, essentially the full exposed area of the filter material

provides trapping of the moisture. Regarding the filtration mechanisms at work, the claimed flow through bulk material, such as layered fiberglass (analogous to a conventional air-conditioning filter), permits trapping through at least three (3) simultaneously occurring mechanisms.

Specifically, the three mechanisms are direct impaction, inertial interception and diffusion. In direct impaction, the particles of ice directly hit the filter element or are trapped as they try to pass through the small voids provided by the filter elements. Inertial impaction occurs when a particle cannot make the turn when it is entrained in an air stream that enters the filter and ultimately flows around the filter elements. The particle continues on a straight path due to inertia and impacts a filter fiber. The diffusion process is when very small particles (on the order of size of a gas molecule) diffuse to the surface of a fiber and stick. The combination of use of essentially the entire exposed filter area together with at least three trapping mechanisms at work provided by Applicants' bulk filter material providing airflow therethrough represents notable progress in providing improved trapping of airborne water or ice particles for refrigeration units that would otherwise form on the evaporator coils.

Shin discloses a refrigerator having increased cooling efficiency. A passage for the flow of the chilled air exhausted from a freezing compartment and a passage for the flow of the chilled air exhausted from a refrigerating compartment are separately formed. An attaching plate 132 is installed near an evaporator 130 in order to primarily cool and dehumidify the chilled air exhausted from the refrigerating compartment. The attaching plate 132 is vertically installed and has a plurality of "pores" 134 which are formed in the

attaching plate to pass the chilled air. Col. 5, lines 21-38 which discloses aspects regarding plate 132 and pores 134 is copied below:

> An attaching plate is vertically installed between inner wall 154 and evaporator 130 with a predetermined distance from inner wall 154. In attaching plate 132, a plurality of pores 134 are formed. Attaching plate 132 is made from a metal, preferably from aluminum. The chilled air conducted along third air duct 156 is directed along a space 158 formed between attaching plate 132 and inner wall 154. A portion of the chilled air in space 158 passes through pores 134 of attaching plate 132 toward evaporator 130. The remaining chilled air is mixed with the chilled air exhausted from refrigerating compartment 110 and directed along first air duct 170, and the mixed air is directed toward evaporator 130. The chilled air passed through pores 134 of attaching plate 132 and directed toward evaporator 130 is primarily cooled through a heat exchange with attaching plate 132 and then is secondarily cooled by evaporator 130. The humidity contained in the chilled air passing through attaching plate 132 is transformed into frost attached to attaching plate 132.

Thus, plate 132 is formed from a non-porous metal, such as aluminum. The plurality of "pores 134" are formed (presumably molded or machined) in plate 132 to allow the chilled air to pass through. Chilled air does not pass through the material comprising plate 132, only through the pores 134 formed therein. This arrangement restricts the condensation and ice trapping to be limited to the area of plate 132 immediately surrounding pores 134.

A heat exchange between the chilled air from the refrigerating compartment and the attaching plate 132 occurs. The humidity contained in the chilled air from the refrigerating compartment is transformed into frost attached to the attaching plate 132. The frost is transformed into water by a heater provided below an evaporator 130 and the attaching plate 132 and is exhausted outward.

Thus, Shin's trapping device is a solid metal plate 132 having a plurality of holes (pores) 134, the "pores" 134 permitting the humidified air to flow therethrough. Clearly, the bulk material (e.g. aluminum) is not a filter material or a material which provides airflow therethrough to the evaporator. As noted above, in such an arrangement, humidity

or ice particles are trapped only on the plate material surrounding the respective "pores" 134 formed in plate 132. Chin's design thus can only trap condensation and ice in the "pores" provided. Accordingly, the full surface area of the plate 132 does not provide filtration. Moreover, the Chin design must rely on direct impaction, since the non-porous filter plate cannot provide the inertial impaction or diffusion mechanisms provided by Applicants' claimed filter design.

In contrast, Applicants' amended claim 1 recites a trapping device comprising a bulk filter material which provides airflow therethrough to the evaporator, wherein at least one metallic element is disposed on a surface or within the filter material. In contrast, as noted above, Shin's metal plate is not a filter material, and the bulk metal plate 132 does not permit flow therethrough. Moreover, Shin also does not disclose or suggest the claimed metallic elements disposed on a surface or within the filter material.

The structural differences between the claimed invention and Shin's design give rise to significant performance differences as noted above. Applicants' claimed filter design provides high trapping efficiency through use of essentially the entire filter area and provides three simultaneously operable trapping mechanisms as compared the Shin's trapping limited to the "pores" formed in the non-porous plate and a single trapping mechanism. Thus, Applicants' claimed bulk filter material providing airflow therethrough represents notable progress over Shin's design for trapping of airborne water or ice particles for refrigeration units that would otherwise form on the evaporator coils. Accordingly, Applicants submit that amended claim 1 and all claims dependent thereon are patentable over the cited art.

The system recited in claim 15 has been amended to correspond to amended claim 1. Amended claim 15 now recites "said trapping device comprising a bulk filter material, said bulk filter material providing airflow therethrough to said evaporator, wherein at least one metallic element is disposed on a surface or within said filter material". Accordingly, in view of the above remarks regarding amended claim 1, Applicants submit that amended claim 15 is patentable over the cited art.

Similarly, amended claim 16 has also been amended to correspond to amended claim 1. Amended claim 16 recites a method for trapping airborne water or ice particles in a refrigeration unit and recites using "trapping device comprising a bulk filter material, said bulk filter material providing airflow therethrough to said evaporator, wherein at least one metallic element is disposed on a surface or within said filter material". Accordingly, in view of the above remarks, Applicants submit that amended claim 16 and its dependent claim are patentable over the cited art.

Applicants have made every effort to present claims which distinguish over the cited art, and it is believed that all claims are now in condition for allowance. However, the Examiner is invited to call the undersigned (at 561-671-3662) if it is believed that a telephonic interview would expedite the prosecution of the application to an allowance.

Although no fee is believed to be due, the Commissioner for Patents is hereby authorized to charge any deficiency in fees due with the filing of this document and during prosecution of this application to Deposit Account No. 50-0951.

Respectfully submitted,

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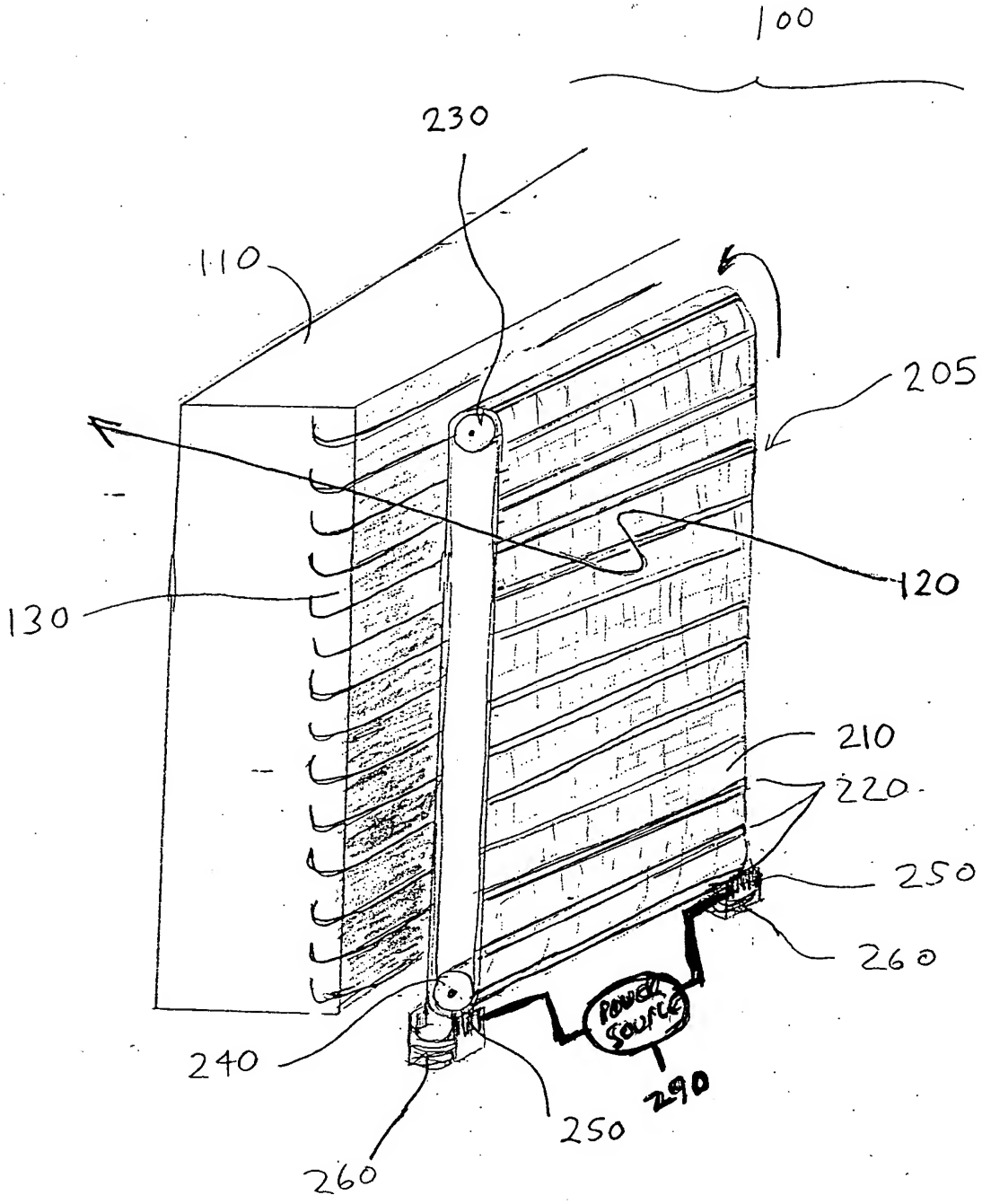
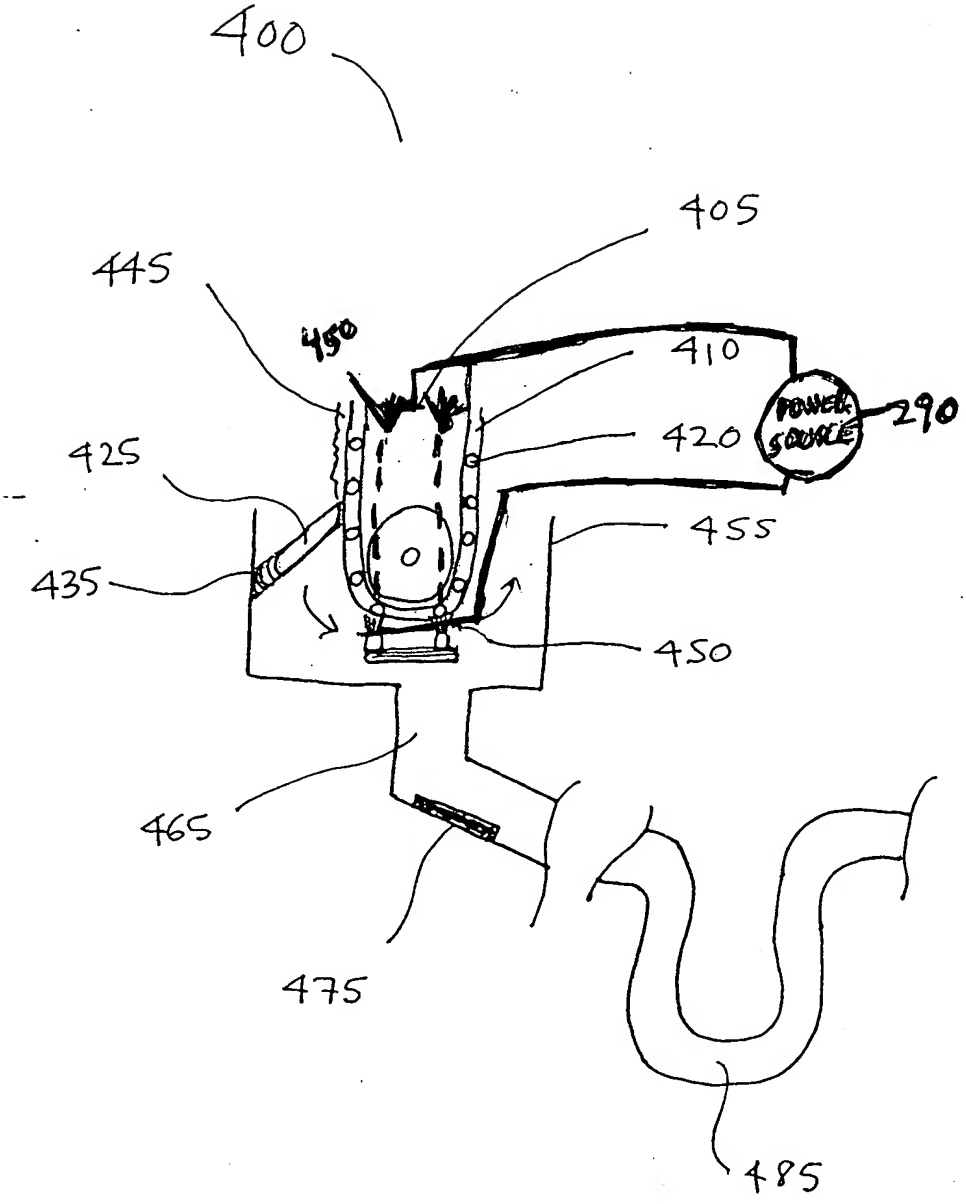


FIG. 1


400
405
445
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410
POWER SOURCE
290
420
425
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435
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485

FIG. 3